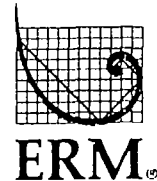


ERM-Southeast, Inc.

215 Centerview Drive
Suite 110
Brentwood, TN 37027
(615) 373-3350
(615) 373-2392 (Fax)

September 22, 1995

Mr. Cliff Kirchof
Schlumberger Services, Inc.
205 Industrial Blvd.
Sugar Land, TX 77478



Dear Mr. Kirchof:

Attached please find the Twelvemile Creek Corbicula Tissue Study report. This study was conducted as a part of the annual aquatic monitoring of the Twelvemile Creek/Lake Hartwell OU2. The results of the study indicate the present relative rate of PCB bioaccumulation in various locations of the Twelvemile Creek watershed. Bioaccumulation was greatest near the Sangamo-Weston discharge in Town Creek and was progressively less in Twelvemile Creek downstream to the backwater of Lake Hartwell. At the backwater location (Maw Bridge) the bioaccumulation was second highest of the six stations sampled.

Bioaccumulation was not observed in Wolf Creek, however, a slight amount of PCB bioaccumulation was detected in Twelvemile Creek upstream of the confluence with Town Creek.

If you have any questions concerning this report, do not hesitate to contact me.

Regards,

James R. Orr
Senior Biologist

Enclosure
JRO/gsq

Offices of
ERM-Southeast, Inc. in:

Brentwood, TN (Nashville)
Kennesaw, GA (Atlanta)
Charlotte, NC
Mobile, AL
Memphis, TN
Charleston, SC
Knoxville, TN

10115920



***TWELVEMILE CREEK
CORBICULA TISSUE STUDY
AUGUST 1995***

***Prepared for
Schlumberger Industries, Inc.***

September 21, 1995

A handwritten signature in cursive script, appearing to read "James R. Orr", written over a horizontal line.

James R. Orr, Project Manager

**ERM-Southeast, Inc.
215 Centerview Drive
Suite 110
Brentwood, TN 37027**

1.0 INTRODUCTION

A corbicula tissue study was conducted at six locations in the Twelvemile Creek watershed, as a part of the annual monitoring of the Sangamo Weston/Twelvemile Creek/Lake Hartwell PCB Contamination Superfund Site - Operable Unit Two. The purpose of the study was to determine the relative rate of bioaccumulation of PCBs in corbicula at various locations in the watershed.

2.0 BACKGROUND

The six sample locations selected in this study were identical to those recommended in the Final Record of Decision dated June, 1994. These locations are depicted in Figure 1. Corbicula utilized in the study were collected from Spencer Creek in Williamson County, Tennessee on July 13, 1995 and held in the ERM-Southeast biomonitoring laboratory until July 18, when they were transported to the Twelvemile Creek watershed. A total of 300 to 350 organisms were collected July 13 and maintained in the laboratory for observation. The organisms were collected from a size range of 15 to 30 millimeters, measuring longitudinally across the shell from branchial opening to foot opening. A total of 20 organisms were sacrificed July 13 and tissues were removed from the shell and frozen to establish the background concentration. The total wet weight of the 20 organisms was approximately 10 grams. During the five-day holding period, less than 1% of the organisms died.

On July 18, organisms were transported to the site in large coolers. Upon arrival at Twelvemile Creek, approximately 25 organisms were placed in each of two wire baskets at each location. Baskets were tied to permanent structures in areas of moderately rapid flow, deep water and shade.

After the 28-day incubation period, the corbicula were collected from the sample locations on August 16, 1995. All baskets were recovered, with the number of live corbicula ranging from 18 to 27 per site. Organisms were removed from the baskets and counted on-site (live and dead), with the live organisms wrapped in aluminum foil, placed in a plastic bag and preserved on ice during transport back to the ERM laboratory for dissection. Tissues were dissected from the shell of each organism composited, and weighed (wet weight) prior to shipping to Northeast Analytical (NEA) in Schenectady, New York for analysis.

3.0 RESULTS

The results of analyses of the seven tissue samples are summarized in Table 1. Seven specific Aroclor compounds are reported by the analytical method with only two detected in the corbicula tissue. The two Aroclors detected were 1248 and



ERM-Southeast, Inc.
Brentwood, Tennessee

CORBICULA BASKET SAMPLING LOCATIONS
IN TWELVEMILE CREEK WATERSHED
JULY/AUGUST 1995

FIGURE

1

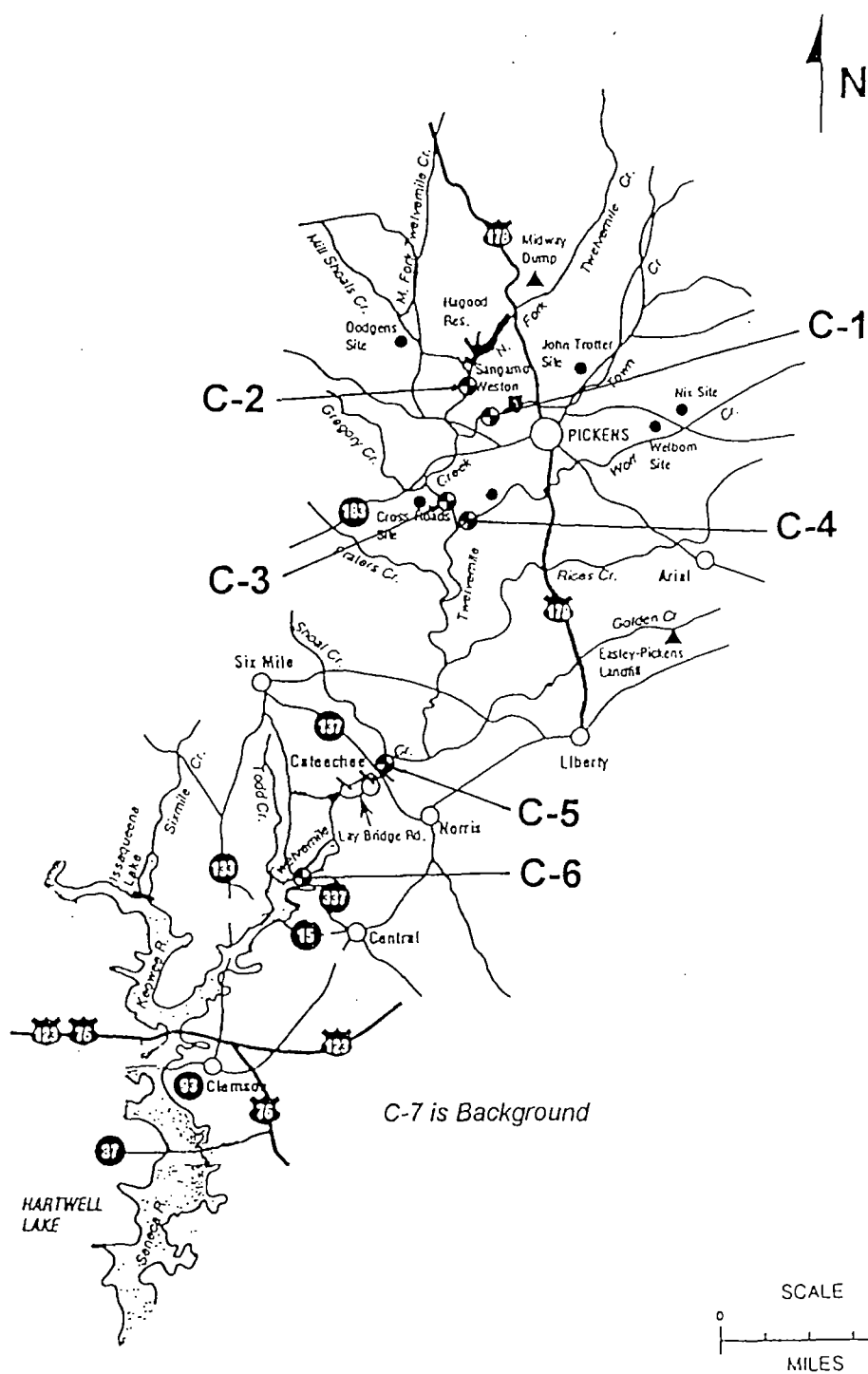


TABLE 1

SCHLUMBERGER INDUSTRIES, INC.
OU-2 STUDY 1995
CORBICULA TISSUE ANALYSES

| Station No. | Aroclor Identification and PCB Concentration (mg/kg) | | | | | | | | | |
|--|--|--------|--------|--------|--------|--------|--------|--------|--|--|
| | 1016 | 1221 | 1232 | 1242 | 1248 | 1254 | 1260 | Total | | |
| C-1: Town Creek downstream of Sangamo Weston | <0.84 | <0.84 | <0.84 | <0.84 | 8.06 | 2.08 | <0.84 | 10.1 | | |
| C-2: Twelvemile Creek upstream of Town Creek | <0.116 | <0.116 | <0.116 | <0.116 | 0.161 | <0.116 | <0.116 | 0.161 | | |
| C-3: Twelvemile Creek at Algood Bridge | <0.68 | <0.68 | <0.68 | <0.68 | 4.29 | 1.56 | <0.68 | 5.85 | | |
| C-4: Wolf Creek | <0.18 | <0.18 | <0.18 | <0.18 | <0.18 | <0.18 | <0.18 | <0.18 | | |
| C-4: Duplicate | <0.165 | <0.165 | <0.165 | <0.165 | <0.165 | <0.165 | <0.165 | <0.165 | | |
| C-5: Twelvemile Creek at 137 Bridge | <0.417 | <0.417 | <0.417 | <0.417 | 1.22 | 0.93 | <0.417 | 2.15 | | |
| C-6: Twelvemile Creek at Maw Bridge (Hwy 337) | <0.592 | <0.592 | <0.592 | <0.592 | 3.72 | 3.09 | <0.592 | 6.81 | | |
| C-7: Corbicula from Spencer Creek, Williamson County, TN - Stock Source | <0.142 | <0.142 | <0.142 | <0.142 | <0.142 | <0.142 | <0.142 | <0.142 | | |

1254, which were detected in five of the seven samples. PCBs were not detected in the background sample, C-7, with a detection limit of 0.142 mg/kg. PCBs were also not detected in corbicula tissues at station C-4, Wolf Creek. The Wolf Creek sample was tested in duplicate with detection limits of 0.18 mg/kg and 0.165 mg/kg. The highest concentrations of PCBs were detected in corbicula tissue downstream of the Sangamo Weston facility in Town Creek at 10.1 mg/kg and appeared to decrease in concentration in Twelvemile Creek downstream from C-1 to C-5 (137 Bridge) to a concentration of 2.15 mg/kg. At C-6, Maw Bridge (Highway 337), the PCB concentration in corbicula tissue increased to 6.81 mg/kg. The PCB concentration in corbicula tissue at the Twelvemile Creek background location (C-2) was 0.161 mg/kg, which is slightly higher than the detection limit of 0.116 mg/kg.

Corbicula are known to bioaccumulate contaminants at a very rapid rate and lack the enzymes necessary for depuration of PCBs from their tissues. The data from this study indicate the relative rates of bioaccumulation of PCBs in the Twelvemile Creek watershed. Bioaccumulation rates appear to be highest near the Sangamo Weston discharge C-1, and at Maw Bridge where Twelvemile Creek starts to enter Lake Hartwell, siltation increases significantly, and PCB concentrations in sediment are higher than upstream.

NORTHEAST ANALYTICAL

ENVIRONMENTAL LAB SERVICES

301 Nott Street, Schenectady, NY 12305
(518) 346-4592 • FAX (518) 381-6055

CERTIFICATE OF ANALYSIS
SEPTEMBER 1, 1995

ERM SOUTHEAST, INC.

214 CENTERVIEW DRIVE, SUITE 110
BRENTWOOD, TN 37037
CONTACT: JIM ORR

CUSTOMER ID: C-1 NEA ID: 956912
SAMPLE MATRIX: TISSUE, CORBICULA DATE SAMPLED: 08/16/95 TIME: N/A
DATE RECEIVED: 08/18/95 TIME: 09:55 DATE TESTED: 08/31/95
SAMPLED BY: N/A LOCATION: SCHLUM, PROJECT #4517
12 MILE CREEK
CUSTOMER PO#: N/A LAB ELAP #: #11078

SW-846 METHOD 8080: POLYCHLORINATED BIPHENYLS

| AROCLOR IDENTIFICATION | PCB CONCENTRATION { $\mu\text{g/g}$ } |
|-------------------------|---------------------------------------|
| AROCLOR 1016 | < 0.840 |
| AROCLOR 1221 | < 0.840 |
| AROCLOR 1232 | < 0.840 |
| AROCLOR 1242 | < 0.840 |
| AROCLOR 1248 | 8.06 |
| AROCLOR 1254 | 2.08 |
| AROCLOR 1260 | < 0.840 |
| TOTAL PCB RESULTS > PQL | 10.1 |

Authorized Signature: _____

James Daly

Northeast Analytical, Inc.
Robert E. Wagner, Laboratory Director

NY STATE DEPARTMENT OF HEALTH CERTIFIED LAB

NORTHEAST ANALYTICAL ENVIRONMENTAL LAB SERVICES

301 Nott Street, Schenectady, NY 12305
(518) 346-4592 • FAX (518) 381-6055

CERTIFICATE OF ANALYSIS
SEPTEMBER 1, 1995

ERM SOUTHEAST, INC.

214 CENTERVIEW DRIVE, SUITE 110
BRENTWOOD, TN 37037
CONTACT: JIM ORR

CUSTOMER ID: C-2 NEA ID: 956913
SAMPLE MATRIX: TISSUE, CORBICULA DATE SAMPLED: 08/16/95 TIME: N/A
DATE RECEIVED: 08/18/95 TIME: 09:55 DATE TESTED: 08/31/95
SAMPLED BY: N/A LOCATION: SCHLUM, PROJECT #4517
12 MILE CREEK
CUSTOMER PO#: N/A LAB ELAP #: #11078

SW-846 METHOD 8080: POLYCHLORINATED BIPHENYLS

| AROCLOR IDENTIFICATION | PCB CONCENTRATION { $\mu\text{g/g}$ } |
|-------------------------|---------------------------------------|
| AROCLOR 1016 | < 0.116 |
| AROCLOR 1221 | < 0.116 |
| AROCLOR 1232 | < 0.116 |
| AROCLOR 1242 | < 0.116 |
| AROCLOR 1248 | 0.161 |
| AROCLOR 1254 | < 0.116 |
| AROCLOR 1260 | < 0.116 |
| TOTAL PCB RESULTS > PQL | 0.161 |

Authorized Signature: _____

James Daly

Northeast Analytical, Inc.
Robert E. Wagner, Laboratory Director

NY STATE DEPARTMENT OF HEALTH CERTIFIED LAB

NORTHEAST ANALYTICAL

ENVIRONMENTAL LAB SERVICES

301 Nott Street, Schenectady, NY 12305
(518) 346-4592 • FAX (518) 381-6055

CERTIFICATE OF ANALYSIS
SEPTEMBER 1, 1995

ERM SOUTHEAST, INC.

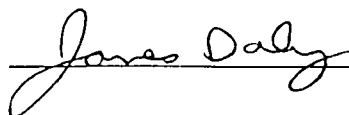
214 CENTERVIEW DRIVE, SUITE 110
BRENTWOOD, TN 37037
CONTACT: JIM ORR

CUSTOMER ID: C-3 NEA ID: 956914
SAMPLE MATRIX: TISSUE, CORBICULA DATE SAMPLED: 08/16/95 TIME: N/A
DATE RECEIVED: 08/18/95 TIME: 09:55 DATE TESTED: 08/31/95
SAMPLED BY: N/A LOCATION: SCHLUM, PROJECT #4517
12 MILE CREEK
CUSTOMER PO#: N/A LAB ELAP #: #11078

SW-846 METHOD 8080: POLYCHLORINATED BIPHENYLS

| AROCLOR IDENTIFICATION | PCB CONCENTRATION { $\mu\text{g/g}$ } |
|-------------------------|---------------------------------------|
| AROCLOR 1016 | < 0.680 |
| AROCLOR 1221 | < 0.680 |
| AROCLOR 1232 | < 0.680 |
| AROCLOR 1242 | < 0.680 |
| AROCLOR 1248 | 4.29 |
| AROCLOR 1254 | 1.56 |
| AROCLOR 1260 | < 0.680 |
| TOTAL PCB RESULTS > PQL | 5.85 |

Authorized Signature: _____



Northeast Analytical, Inc.
Robert E. Wagner, Laboratory Director

NY STATE DEPARTMENT OF HEALTH CERTIFIED LAB

NORTHEAST ANALYTICAL ENVIRONMENTAL LAB SERVICES

301 Nott Street, Schenectady, NY 12305
(518) 346-4592 • FAX (518) 381-6055

CERTIFICATE OF ANALYSIS
SEPTEMBER 1, 1995

ERM SOUTHEAST, INC.

214 CENTERVIEW DRIVE, SUITE 110
BRENTWOOD, TN 37037
CONTACT: JIM ORR

CUSTOMER ID: C-4 NEA ID: 956915
SAMPLE MATRIX: TISSUE, CORBICULA DATE SAMPLED: 08/16/95 TIME: N/A
DATE RECEIVED: 08/18/95 TIME: 09:55 DATE TESTED: 08/31/95
SAMPLED BY: N/A LOCATION: SCHLUM, PROJECT #4517
12 MILE CREEK
CUSTOMER PO#: N/A LAB ELAP #: #11078

SW-846 METHOD 8080: POLYCHLORINATED BIPHENYLS

| AROCLOR IDENTIFICATION | PCB CONCENTRATION { $\mu\text{g/g}$ } |
|-------------------------|---------------------------------------|
| AROCLOR 1016 | < 0.180 |
| AROCLOR 1221 | < 0.180 |
| AROCLOR 1232 | < 0.180 |
| AROCLOR 1242 | < 0.180 |
| AROCLOR 1248 | < 0.180 |
| AROCLOR 1254 | < 0.180 |
| AROCLOR 1260 | < 0.180 |
| TOTAL PCB RESULTS > PQL | 0 |

Authorized Signature: _____

James Daly

Northeast Analytical, Inc.
Robert E. Wagner, Laboratory Director

NY STATE DEPARTMENT OF HEALTH CERTIFIED LAB

NORTHEAST ANALYTICAL

ENVIRONMENTAL LAB SERVICES

301 Nott Street, Schenectady, NY 12305
(518) 346-4592 • FAX (518) 381-6055

CERTIFICATE OF ANALYSIS
SEPTEMBER 1, 1995

ERM SOUTHEAST, INC.

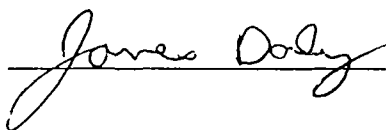
214 CENTERVIEW DRIVE, SUITE 110
BRENTWOOD, TN 37037
CONTACT: JIM ORR

CUSTOMER ID: C-4/DUPLICATE NEA ID: 956915D
SAMPLE MATRIX: TISSUE, CORBICULA DATE SAMPLED: 08/16/95 TIME: N/A
DATE RECEIVED: 08/18/95 TIME: 09:55 DATE TESTED: 08/31/95
SAMPLED BY: N/A LOCATION: SCHLUM, PROJECT #4517
12 MILE CREEK
CUSTOMER PO#: N/A LAB ELAP #: #11078

SW-846 METHOD 8080: POLYCHLORINATED BIPHENYLS

| AROCLOR IDENTIFICATION | PCB CONCENTRATION { $\mu\text{g/g}$ } |
|-------------------------|---------------------------------------|
| AROCLOR 1016 | < 0.165 |
| AROCLOR 1221 | < 0.165 |
| AROCLOR 1232 | < 0.165 |
| AROCLOR 1242 | < 0.165 |
| AROCLOR 1248 | < 0.165 |
| AROCLOR 1254 | < 0.165 |
| AROCLOR 1260 | < 0.165 |
| TOTAL PCB RESULTS > PQL | 0 |

Authorized Signature: _____



Northeast Analytical, Inc.
Robert E. Wagner, Laboratory Director

NY STATE DEPARTMENT OF HEALTH CERTIFIED LAB

NORTHEAST ANALYTICAL

ENVIRONMENTAL LAB SERVICES

301 Nott Street, Schenectady, NY 12305
(518) 346-4592 • FAX (518) 381-6055

CERTIFICATE OF ANALYSIS
SEPTEMBER 1, 1995

ERM SOUTHEAST, INC.

214 CENTERVIEW DRIVE, SUITE 110
BRENTWOOD, TN 37037
CONTACT: JIM ORR

CUSTOMER ID: C-5 NEA ID: 956916
SAMPLE MATRIX: TISSUE, CORBICULA DATE SAMPLED: 08/16/95 TIME: N/A
DATE RECEIVED: 08/18/95 TIME: 09:55 DATE TESTED: 08/31/95
SAMPLED BY: N/A LOCATION: SCHLUM, PROJECT #4517
12 MILE CREEK
CUSTOMER PO#: N/A LAB ELAP #: #11078

SW-846 METHOD 8080: POLYCHLORINATED BIPHENYLS

| AROCLOR IDENTIFICATION | PCB CONCENTRATION {µg/g} |
|-------------------------|--------------------------|
| AROCLOR 1016 | < 0.417 |
| AROCLOR 1221 | < 0.417 |
| AROCLOR 1232 | < 0.417 |
| AROCLOR 1242 | < 0.417 |
| AROCLOR 1248 | 1.22 |
| AROCLOR 1254 | 0.930 |
| AROCLOR 1260 | < 0.417 |
| TOTAL PCB RESULTS > PQL | 2.15 |

Authorized Signature: _____

James Daly

Northeast Analytical, Inc.
Robert E. Wagner, Laboratory Director

NY STATE DEPARTMENT OF HEALTH CERTIFIED LAB

NORTHEAST ANALYTICAL

ENVIRONMENTAL LAB SERVICES

301 Nott Street, Schenectady, NY 12305
(518) 346-4592 • FAX (518) 381-6055

CERTIFICATE OF ANALYSIS
SEPTEMBER 1, 1995

ERM SOUTHEAST, INC.

214 CENTERVIEW DRIVE, SUITE 110
BRENTWOOD, TN 37037
CONTACT: JIM ORR

CUSTOMER ID: C-6 NEA ID: 956917
SAMPLE MATRIX: TISSUE, CORBICULA DATE SAMPLED: 08/16/95 TIME: N/A
DATE RECEIVED: 08/18/95 TIME: 09:55 DATE TESTED: 08/31/95
SAMPLED BY: N/A LOCATION: SCHLUM, PROJECT #4517
12 MILE CREEK
CUSTOMER PO#: N/A LAB ELAP #: #11078

SW-846 METHOD 8080: POLYCHLORINATED BIPHENYLS

| AROCLOR IDENTIFICATION | PCB CONCENTRATION { $\mu\text{g/g}$ } |
|-------------------------|---------------------------------------|
| AROCLOR 1016 | < 0.592 |
| AROCLOR 1221 | < 0.592 |
| AROCLOR 1232 | < 0.592 |
| AROCLOR 1242 | < 0.592 |
| AROCLOR 1248 | 3.72 |
| AROCLOR 1254 | 3.09 |
| AROCLOR 1260 | < 0.592 |
| TOTAL PCB RESULTS > PQL | 6.81 |

Note: Aroclor 1248 exhibited an altered chromatographic pattern.

Authorized Signature: _____

James Daly

Northeast Analytical, Inc.
Robert E. Wagner, Laboratory Director

NY STATE DEPARTMENT OF HEALTH CERTIFIED LAB

NORTHEAST ANALYTICAL

ENVIRONMENTAL LAB SERVICES

301 Nott Street, Schenectady, NY 12305
(518) 346-4592 • FAX (518) 381-6055

CERTIFICATE OF ANALYSIS
SEPTEMBER 1, 1995

ERM SOUTHEAST, INC.

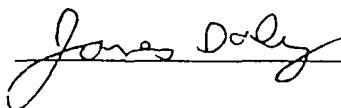
214 CENTERVIEW DRIVE, SUITE 110
BRENTWOOD, TN 37037
CONTACT: JIM ORR

CUSTOMER ID: C-7 NEA ID: 956918
SAMPLE MATRIX: TISSUE, CORBICULA DATE SAMPLED: 08/16/95 TIME: N/A
DATE RECEIVED: 08/18/95 TIME: 09:55 DATE TESTED: 08/31/95
SAMPLED BY: N/A LOCATION: SCHLUM, PROJECT #4517
12 MILE CREEK
CUSTOMER PO#: N/A LAB ELAP #: #11078

SW-846 METHOD 8080: POLYCHLORINATED BIPHENYLS

| AROCLOR IDENTIFICATION | PCB CONCENTRATION {µg/g} |
|-------------------------|--------------------------|
| AROCLOR 1016 | < 0.142 |
| AROCLOR 1221 | < 0.142 |
| AROCLOR 1232 | < 0.142 |
| AROCLOR 1242 | < 0.142 |
| AROCLOR 1248 | < 0.142 |
| AROCLOR 1254 | < 0.142 |
| AROCLOR 1260 | < 0.142 |
| TOTAL PCB RESULTS > PQL | 0 |

Authorized Signature: _____



Northeast Analytical, Inc.
Robert E. Wagner, Laboratory Director

NY STATE DEPARTMENT OF HEALTH CERTIFIED LAB

CHAIN OF CUSTODY RECORD

[illegible]